

[Claims]

1. A portable terminal having a dual display panel, comprising:

a body having a plurality of function keys and
5 number keys;

a folder coupled to the body by hinges to be folded and unfolded about the hinges, and having on one surface thereof a main display panel and on the other surface thereof a sub display panel which is coupled to
10 the folder by hinges to be folded and unfolded about the hinges, the folder being capable of providing a single extended screen through cooperation of the main display panel and the sub display panel; and

a display module for controlling the main display
15 panel and the sub display panel such that the main display panel and the sub display panel are independently driven when the sub display panel is folded and are cooperatively driven to form the single extended screen when the sub display panel is unfolded;

20 the display module comprising:

a main scan driver for sequentially selecting and scanning row lines of the main display panel;

a main data driver for applying image data signals to column lines of the main display panel;

25 a sub scan driver for sequentially selecting and scanning row lines of the sub display panel;

a sub data driver for applying image data signals

to column lines of the sub display panel; and

a controller for implementing a control task such that the main scan driver and the main data driver are driven to operate the main display panel and such that
5 the main scan driver, the main data driver, the sub scan driver and the sub data driver are driven to operate the main display panel and the sub display panel to form the single extended screen;

the controller comprising:

10 a window read/write circuit section for reading and writing window data from and to a main system of the portable terminal;

a main video memory for storing main scan data signals and main image data signals for driving the main
15 display panel;

a sub video memory for storing sub scan data signals and sub image data signals for driving the sub display panel;

a logical/physical mapping circuit section for
20 logically or physically mapping data transmitted between the main video memory and the sub video memory and the window read/write circuit section;

an XY converting logic section for XY-converting and outputting the sub scan data signals and the sub
25 image data signals stored in the sub video memory, in response to a signal from a flip sensor;

a main scan/data interface section for

transmitting the main scan data signals and the main image data signals received from the main video memory to the main scan driver and the main data driver; and

a sub scan/data interface section for transmitting
5 the sub scan data signals and the sub image data signals received from the XY converting logic section to the sub scan driver and the sub data driver.

2. The portable terminal according to claim 1,
10 wherein the folder provides the single extended screen having no substantial gap thereon, through cooperation of the main display panel and the sub display panel.

3. The portable terminal according to claim 1,
15 wherein the main display panel and the sub display panel are formed to extend to an edge of the folder such that no substantial gap is created between the main display panel and the sub display panel when the sub display panel is unfolded.

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4. The portable terminal according to claim 1, wherein the single extended screen comprises a window screen having an aspect ratio of 16:9.

25 5. The portable terminal according to claim 1, further comprising:

a flip sensor for sensing folded and unfolded

states of the sub display panel.

6. The portable terminal according to claim 1,
wherein at least one of text information including a
5 translated dialogue and communication information of the
portable terminal is displayed on a portion of the
screen.

7. The portable terminal according to claim 1,
10 wherein an antenna of the portable terminal is installed
to be positioned opposite to the hinges by which the sub
display panel is coupled to the folder.

8. The portable terminal according to claim 1,
15 wherein main icons configured on the main display panel
and sub icons configured on the sub display panel are
arranged in the same direction when the sub display
panel is unfolded.

20 9. The portable terminal according to claim 8,
wherein a menu function is provided to the main icons by
using one of an under bar, a square and a reverse so
that a corresponding operation can be implemented.

25 10. The portable terminal according to claim 8,
wherein the sub icons have shapes which are symmetrical
in both longitudinal and transverse directions so that

expressional functionality of the sub icons is maintained when the sub display panel is unfolded.

11. The portable terminal according to claim 1,
5 wherein each of the main display panel and the sub display panel comprises a flat panel display such as an organic LED and an LCD.

12. The portable terminal according to claim 1,
10 wherein the logical/physical mapping circuit section comprises:

a subtracter for receiving a coordinate XL and a coordinate X_m ;

an adder for receiving a coordinate YL and a
15 coordinate Y_m ;

a first comparator for receiving the coordinate XL and a coordinate 0;

a second comparator for receiving the coordinate XL and the coordinate X_m ;

20 a third comparator for receiving the coordinate XL and a coordinate $X_m + X_s$;

a logic combining section for receiving output signals from the first through third comparators;

a first MUX for selecting one of the coordinate XL
25 and an output signal from the subtracter in response to an output signal from the logic combining section and outputting the selected one as a coordinate XP; and

a second MUX for selecting one of the coordinate YL and an output signal from the adder in response to an output signal from the logic combining section and outputting the selected one as a coordinate YP;

5 wherein the coordinates (XL,YL) are coordinates on a window W1 of a logical display memory, the coordinates X_m, Y_m) are coordinates of the main display panel having a screen size of $X_m \times Y_m$, the coordinates (X_s, Y_s) are coordinates of the sub display panel W2 having a screen
10 size of $X_s \times Y_s$, and the coordinates (XP,YP) are coordinates of a physical video memory which correspond to the coordinates (XL,YL) on the window W1 of the logical display memory.

15 13. The portable terminal according to claim 1, wherein the window read/write circuit section comprises:

 a first subtracter for receiving a coordinate Xe and a coordinate Xb;

 a first register for storing an output signal of
20 the first subtracter;

 a first adder for receiving an output signal of the first register and adding one by one;

 a second subtracter for receiving a coordinate Ye and a coordinate Yb;

25 a second register for storing an output signal of the second subtracter;

 a second adder for receiving an output signal of

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the second register and adding one by one;

a multiplexer for selecting one of output signals from the first and second adders;

a third register for storing an output signal of
5 the multiplexer;

a control logic part for receiving an output signal of the third register, a clock signal and a read/write command signal;

a counter circuit part for receiving an output
10 signal of the control logic part;

a modifier for receiving output signals of the first register and the counter circuit part;

a divider for receiving output signals of the first register and the counter circuit part;

15 a third adder for receiving an output signal of the modifier and the coordinate X_b and generating the coordinate X_L ; and

a fourth adder for receiving an output signal of the divider and the coordinate Y_b and generating the
20 coordinate Y_L ;

wherein the coordinates (X_b, Y_b) and (X_e, Y_e) are coordinates on a window of the logical display memory, the coordinates (X_L, Y_L) are coordinates on the window of the logical display memory, and inequalities $X_e > X_b$ and
25 $Y_e > Y_b$ are satisfied.

14. A method for controlling display on a screen

of a portable terminal having a body which possesses a plurality of function keys and number keys and a folder which is coupled to the body by hinges to be folded and unfolded about the hinges and possesses on one surface thereof a main display panel and on the other surface thereof a sub display panel coupled to the folder by hinges to be folded and unfolded about the hinges, the method comprising the steps of:

controlling by a controller the main display panel and the sub display panel when the sub display panel is folded, such that the main display panel and the sub display panel are independently driven; and

controlling by the controller the main display panel and the sub display panel when the sub display panel is unfolded, such that the main display panel and the sub display panel are cooperatively driven to form a single extended screen having no substantial gap thereon;

wherein the single extended screen comprises a window screen having an aspect ratio of 16:9; and

wherein, when assuming that the main display panel has a size of $X_m \times Y_m$ and the sub display panel has a size of $X_s \times Y_s$ and when considering an equation for constructing the window screen of 16:9, $(X_m + X_s) : Y_s = 16 : 9$, the window screen having the aspect ratio of 16:9 satisfies an inequality $(X_m + X_s) \geq 16Y_s/9$ ($X_m \geq X_s$ and $Y_m \geq Y_s$).

15. The method according to claim 14, wherein the main display panel and the sub display panel are formed to extend to an edge of the folder such that no substantial gap is created between the main display
5 panel and the sub display panel when the sub display panel is unfolded to form the single extended screen.

16. The method according to claim 14, wherein at least one of text information including a translated
10 dialogue and communication information of the portable terminal is displayed on a portion of the single extended screen.

17. The method according to claim 14, wherein main
15 icons configured on the main display panel and sub icons configured on the sub display panel are arranged in the same direction when the sub display panel is unfolded to form the single extended screen.

20 18. The method according to claim 17, wherein a menu function is provided to the main icons by using one of an under bar, a square and a reverse so that a corresponding operation can be implemented.

25 19. The method according to claim 17, wherein the sub icons have shapes which are symmetrical in both longitudinal and transverse directions so that

expressional functionality of the sub icons is maintained when the sub display panel is unfolded to form the single extended screen.

5 20. A device for controlling display on a screen of a portable terminal having a dual display panel, comprising:

 a main scan driver for sequentially selecting and scanning row lines of a main display panel;

10 a main data driver for applying image data signals to column lines of the main display panel;

 a sub scan driver for sequentially selecting and scanning row lines of a sub display panel;

 a sub data driver for applying image data signals
15 to column lines of the sub display panel; and

 a controller for controlling the drivers such that the main display panel and the sub display panel are independently driven or the main display panel and the sub display panel are cooperatively driven to form a
20 single extended screen;

 the controller comprising:

 a window read/write circuit section for reading and writing window data from and to a main system of the portable terminal;

25 a main video memory for storing main scan data signals and main image data signals for driving the main display panel;

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a sub video memory for storing sub scan data signals and sub image data signals for driving the sub display panel;

a logical/physical mapping circuit section for
5 logically or physically mapping data transmitted between the main video memory and the sub video memory and the window read/write circuit section;

an XY converting logic section for XY-converting and outputting the sub scan data signals and the sub
10 image data signals stored in the sub video memory, in response to a signal from a flip sensor;

a main scan/data interface section for transmitting the main scan data signals and the main image data signals received from the main video memory
15 to the main scan driver and the main data driver; and

a sub scan/data interface section for transmitting the sub scan data signals and the sub image data signals received from the XY converting logic section to the sub scan driver and the sub data driver.

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21. The device according to claim 20, wherein the logical/physical mapping circuit section comprises:

a subtracter for receiving a coordinate XL and a coordinate X_m ;

25 an adder for receiving a coordinate YL and a coordinate Y_m ;

a first comparator for receiving the coordinate XL

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and a coordinate 0;

a second comparator for receiving the coordinate XL and the coordinate X_m ;

a third comparator for receiving the coordinate XL
5 and a coordinate $X_m + X_s$;

a logic combining section for receiving output signals from the first through third comparators;

a first MUX for selecting one of the coordinate XL and an output signal from the subtracter in response to
10 an output signal from the logic combining section and outputting the selected one as a coordinate XP; and

a second MUX for selecting one of the coordinate YL and an output signal from the adder in response to an output signal from the logic combining section and
15 outputting the selected one as a coordinate YP;

wherein the coordinates XL and YL are coordinates on a window W1 of a logical display memory, the coordinates X_m and Y_m are coordinates of the main display panel having a screen size of $x_m \times y_m$, the coordinate X_s
20 is a coordinate of the sub display panel W2 having a screen size of $X_s \times Y_s$, and the coordinates XP and YP are coordinates of a physical video memory which correspond to the coordinates XL and YL on the window W1 of the logical display memory.

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22. The device according to claim 20, wherein the window read/write circuit section comprises:

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a first subtracter for receiving a coordinate X_e and a coordinate X_b ;

a first register for storing an output signal of the first subtracter;

5 a first adder for receiving an output signal of the first register and adding one by one;

a second subtracter for receiving a coordinate Y_e and a coordinate Y_b ;

10 a second register for storing an output signal of the second subtracter;

a second adder for receiving an output signal of the second register and adding one by one;

a multiplexer for selecting one of output signals from the first and second adders;

15 a third register for storing an output signal of the multiplexer;

a control logic part for receiving an output signal of the third register, a clock signal and a read/write command signal;

20 a counter circuit part for receiving an output signal of the control logic part;

a modifier for receiving output signals of the first register and the counter circuit part;

25 a divider for receiving output signals of the first register and the counter circuit part;

a third adder for receiving an output signal of the modifier and the coordinate X_b and generating the

coordinate XL; and

a fourth adder for receiving an output signal of the divider and the coordinate Yb and generating the coordinate YL;

5 wherein the coordinates Xb and Yb and Xe and Ye are coordinates on a window of the logical display memory, the coordinates XL and YL are coordinates on the window of the logical display memory, and inequalities $X_e > X_b$ and $Y_e > Y_b$ are satisfied.